UNDERGRADUATE MATH SEMINAR

The next seminar of the term will be

DATE: THURSDAY, October 25
Time & 12:30pm – Refreshments in Bailey 204
Location: 1:00 – Seminar in Bailey 207

In this seminar, Professor Paul Friedman from the Department of Mathematics at Union College will deliver the following talk

Title: Solving the General Cubic Equation

Abstract: The solution to the general quadratic equation, $ax^2 + bx + c = 0$, is well-known to most high school students:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

It was also known to many "ancient" cultures … some dating back to 2000 BC! However, the solution to the general cubic equation, $ax^3 + bx^2 + cx + d = 0$, is not as well-known, and it was not found until the 1500s.

In this talk, we will look at how the Renaissance mathematicians Scipione del Ferro, Tartaglia, and Cardano, solved the cubic equation, though we will do so using modern language and notation. As a cute consequence, we will be able to derive some remarkable identities, such as

$$3\sqrt{26} + 15\sqrt{3} + 3\sqrt{26} - 15\sqrt{3} = 4.$$
Is a Picture Worth One Good Proof?

In math, one learns the formula giving the sum of a geometric series:

For \( |r| < 1 \),

\[
a + ar + ar^2 + ar^3 + \cdots = \frac{a}{1-r}.
\]

Now, this is typically proved by first developing, and proving, the formula for the nth partial sum of the series on the left. (This is a nice Math 199 exercise.)

\[
S_n = a + ar + ar^2 + \cdots + ar^n = a \frac{1 - r^{n+1}}{1 - r}
\]

Then, one proves the result by looking at the limit of the partial sums as \( \lim_{n \to \infty} S_n \).

An example of this formula in action, taking \( a = \frac{1}{4} \) and \( r = \frac{1}{4} \) as well, is

\[
\frac{1}{4} + \left( \frac{1}{4} \right)^2 + \left( \frac{1}{4} \right)^3 + \cdots = \frac{\frac{1}{4}}{1 - \frac{1}{4}} = \frac{\frac{1}{4}}{\frac{3}{4}} = \frac{1}{3}
\]

But, this example formula can also be proved by the following picture! Whaddya think?

![Picture from https://vishal12.wordpress.com/2013/05/10/proof-without-words-vii/](https://vishal12.wordpress.com/2013/05/10/proof-without-words-vii/)

REMINDER: The petition acceptance period is Tuesday, 10/23 through Thursday, 10/25.

Problem of the Newsletter – October 22, 2018

**Last week’s problem:** Thank you Hoang Tran ’22 for working on last week’s problem. A sample solution has been posted at the newsletter sites in Bailey Hall.

**This week’s problem:** A quickie? Suppose that the positive divisors of an even four-digit number \( n \) are listed in increasing order as \( 1, 2, \ldots, n/2, n \). If the number 323 appears on this list, what is the smallest possible divisor of \( n \) that appear to the right of 323 on this list?

**Professor Friedman** (friedmap@union.edu) will accept solutions until midnight on Friday, October 26.